Claims

We claim:

1. A method of forming an integrated circuit capacitor, comprising:

forming a lower electrode on a substrate;

forming a metal preprocessed layer on the lower electrode using chemical vapor deposition in which a metal precursor is used as a source gas and the metal precursor comprises oxygen;

forming a dielectric layer on the metal preprocessed layer; and

forming an upper electrode on the dielectric layer.

2. The method of Claim 1, wherein the lower electrode comprises at least one material selected from a group of materials consisting of polysilicon, a noble metal, and metal nitride.

3. The method of Claim 2, wherein the noble metal is selected from a group of noble metals consisting of Ru, Pt, and Ir.

4. The method of Claim 2, wherein the metal nitride is selected from a group of metal nitrides consisting of titanium nitride, tantalum nitride, and tungsten nitride.

5. The method of Claim 1, wherein the metal precursor comprises Ta.

6. The method of Claim 1, wherein the metal precursor comprises a material selected from a group of materials consisting of $Ta(OCH_2H_5)_5$ and $Ta(OCH_3)_5$.

7. The method of Claim 1, wherein forming the metal preprocessed layer comprises:

placing the substrate into a reaction chamber;

adsorbing the metal precursor in the lower electrode;

reacting the metal precursor with the lower electrode; and

purging the metal precursor from the reaction chamber.

8. The method of Claim 7, wherein a flow rate of the metal precursor during deposition is about 1 - 2000 sccm.

9. The method of Claim 7, wherein a temperature in the reaction chamber is about 100° C - 600° C.

10. The method of Claim 7, wherein purging the metal precursor comprises purging the metal precursor from the reaction chamber using a purge gas selected from a group of purge gases consisting of argon and nitrogen.

11. The method of Claim 7, wherein a pressure in the reaction chamber is about 0.1 - 30 torr.

12. The method of Claim 1, wherein the dielectric layer comprises a metal oxide layer.

13. The method of Claim 12, wherein forming the metal oxide layer comprises:

placing the substrate into a reaction chamber;

introducing a metal source gas into the reaction chamber;

adsorbing the metal source gas in the lower electrode;

purging the metal source gas from the reaction chamber;

introducing an oxygen source gas into the reaction chamber;

adsorbing the oxygen source gas in the lower electrode; and

reacting the adsorbed metal source gas with the adsorbed oxygen source gas.

14. The method of Claim 13, wherein the metal oxide layer comprises tantalum oxide.

15. The method of Claim 13, wherein the metal source gas comprises a source gas selected from a group of source gases consisting of $Ta(OCH_2H_5)_5$, $Ta(OCH_3)_5$, and $TaCl_5$

16. The method of Claim 13, wherein the oxygen source gas comprises at least one source gas selected from a group of source gases consisting of H_2O, H_2O_2, O_2, N_2O, and O_3.

17. The method of Claim 13, wherein a flow rate of the metal source gas and a flow rate of the oxygen source gas during deposition is about 1 - 2000 sccm.

18. The method of Claim 13, wherein a temperature in the reaction chamber is about 100° C - 600° C.

19. The method of Claim 13, wherein purging the metal source gas comprises purging the metal source gas from the reaction chamber using a purge gas selected from a group of purge gases consisting of argon and nitrogen.

20. The method of Claim 13 wherein a pressure in the reaction chamber is about 0.1 - 10 torr.

21. The method of Claim 1, wherein the upper electrode comprises at least one material selected from a group of materials consisting of polysilicon, a noble metal, and metal nitride.

22. The method of Claim 21, wherein the noble metal is selected from a group of noble metals consisting of Ru, Pt, and Ir.

23. The method of Claim 21, wherein the metal nitride is selected from a group of metal nitrides consisting of titanium nitride, tantalum nitride, and tungsten nitride.